Feb. 27, 1962 M. HURA 3,023,314

X-RAY APPARATUS

Filed Feb. 13, 1959 3 Sheets-Sheet 1

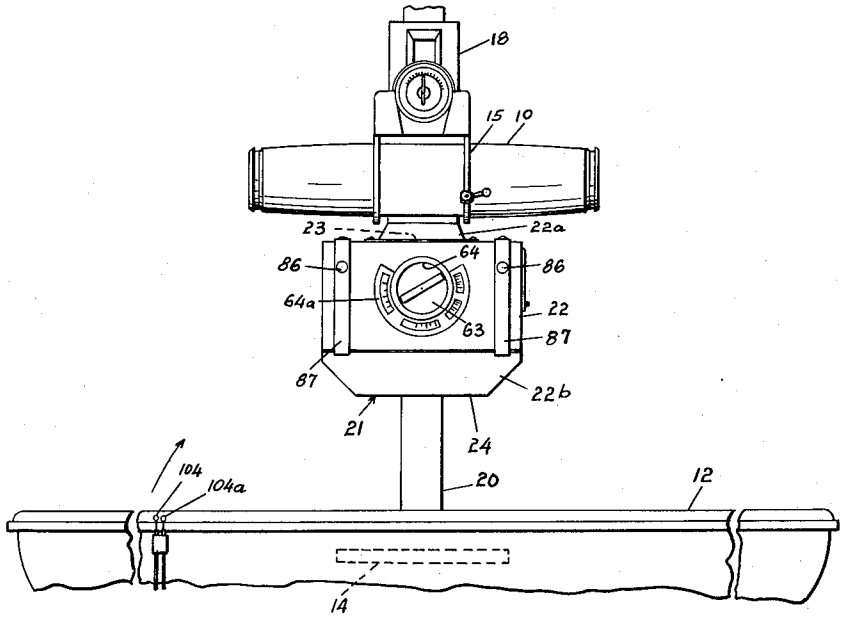

Fig. 1

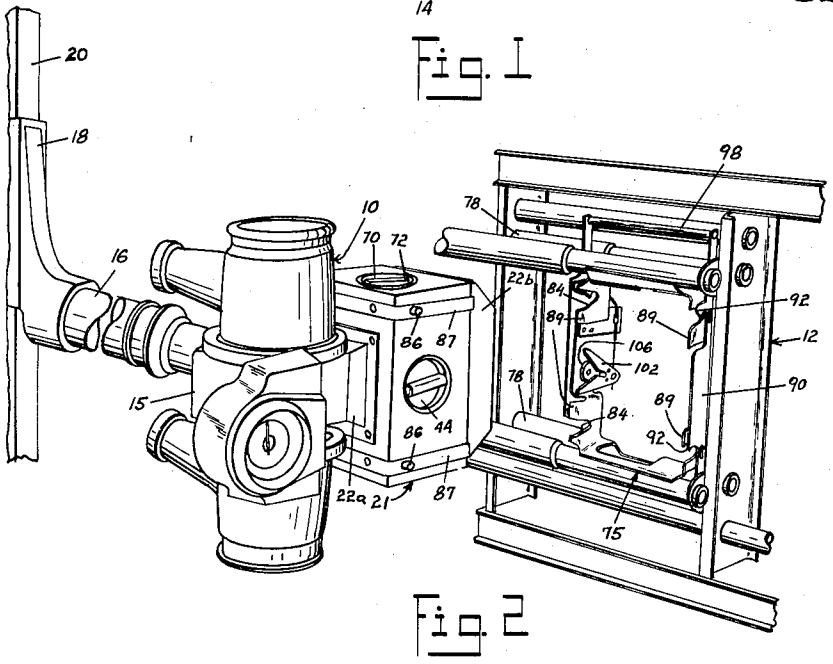

Fig. 2

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X-RAY APPARATUS

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Fig. 3

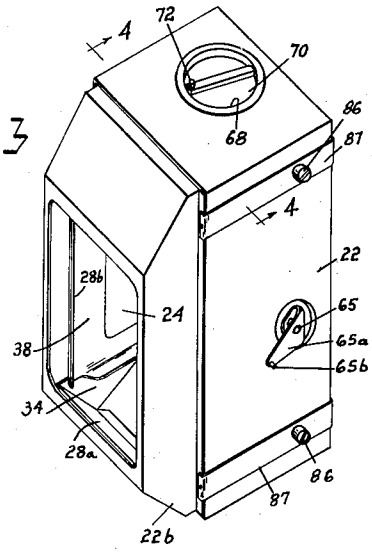


Fig. 5

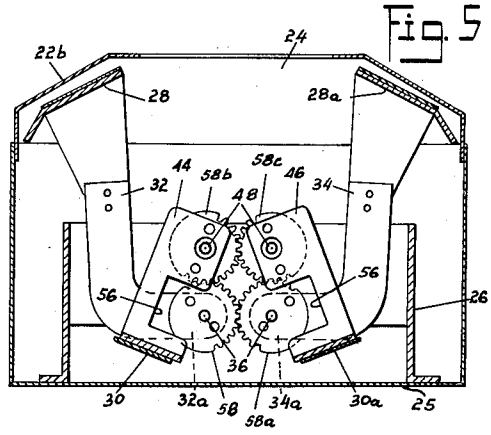
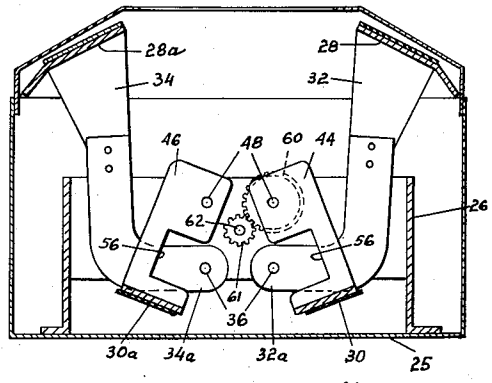


Fig. 6



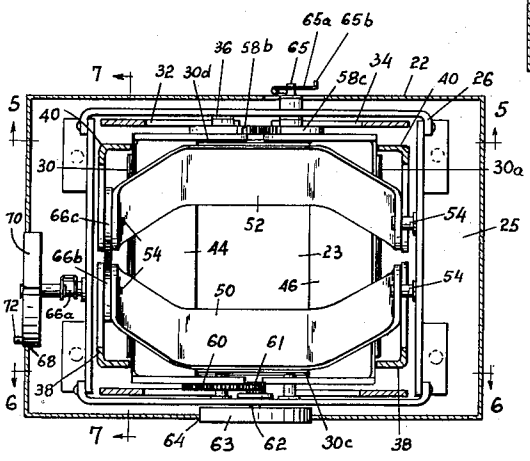


Fig. 4

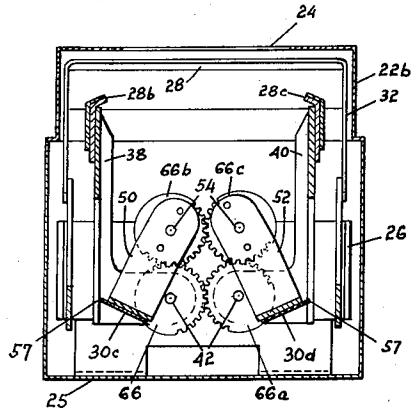


Fig. 7

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X-RAY APPARATUS

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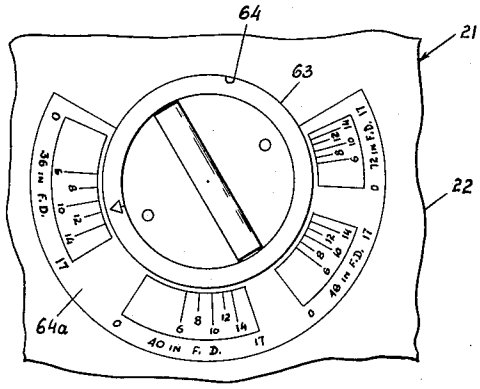

Fig. 10

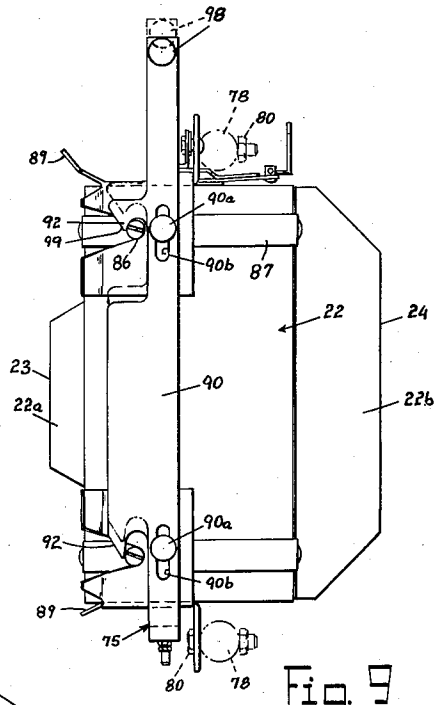

Fig. 9

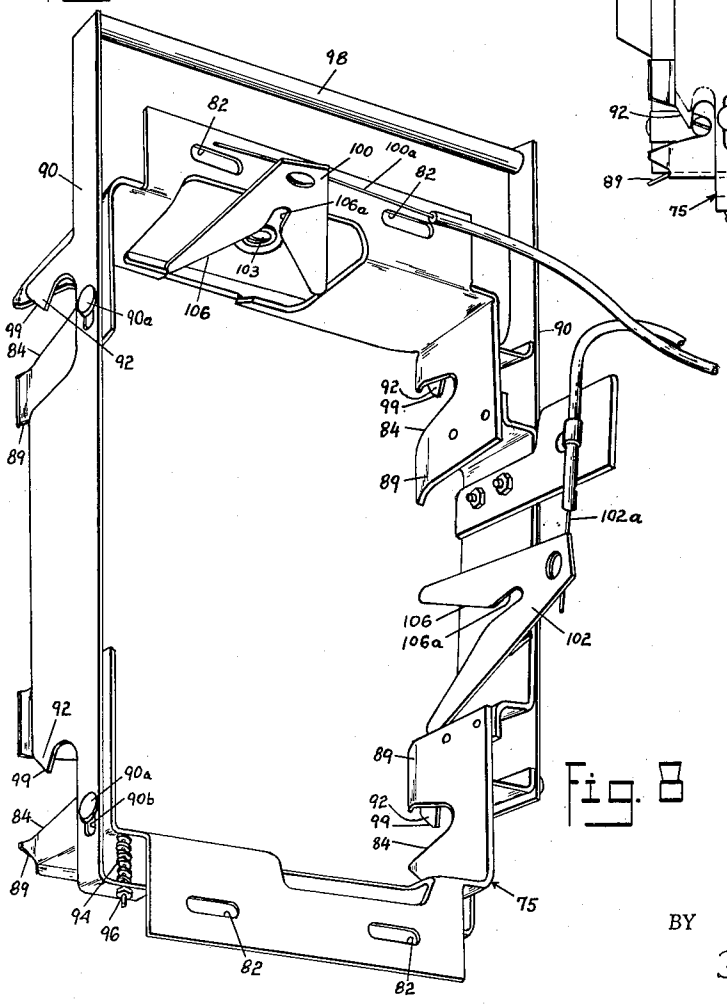

Fig. 8

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3,023,314

X-RAY APPARATUS

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Filed Feb. 13, 1959, Ser. No. 793,154
12 Claims. (Cl. 250—105)

This invention relates in general to improvements in X-ray apparatus and more particularly to improved diaphragm or collimator apparatus for controlling the field of radiation from the source of the X-rays.

X-ray impermeable, adjustable diaphragm apparatus for limiting the field of radiation emanating from a source of X-rays to provide for radiation protection and control of the X-ray beam is known in the art. Furthermore, as is understood, fluoroscopy and radiography usually present different set-up problems for the roentgenologist. In a fluoroscopic examination, the visual effect of X-rays upon a fluoroscopic screen is produced to enable the roentgenologist to see in shadow form the interior of the subject through which the X-rays pass. In a radiographic examination, the X-rays pass through the subject being examined and a light and shadow picture of the interior of the subject is recorded on a radiographic film plate.

A convenient arrangement for the performance of a fluoroscopic examination is while the tilt table of the X-ray apparatus is in a generally vertical position and with the X-ray tube and associated diaphragm apparatus facing and preferably coupled to the underside or bottom side of the table. When the fluoroscopic portion of the examination is finished, the tilt table may be moved to a generally horizontal position and an X-ray tube and diaphragm unit located to operably face the upper or top surface of the table, after which a radiographic examination may be conveniently performed by shooting through the subject and the table top, and taking a radiographic picture on a cassette suspended from the table.

If a single X-ray tube and diaphragm unit is used for both fluoroscopic and radiographic examinations—the latter arrangement providing for obvious economies in the initial cost and maintenance of the X-ray apparatus—various problems arise concerning, for instance, the coupling of the X-ray tube and diaphragm mechanism to the underside of the table, conveniently controlling the operation of the diaphragm mechanism while it is so coupled, and uncoupling the diaphragm mechanism and associated X-ray tube from the table.

Accordingly, it is an object of this invention to provide an improved diaphragm or collimator mechanism for use with an X-ray tube, and wherein the tube and diaphragm mechanism as a unit, may be expeditiously utilized both from above the table of the X-ray apparatus and from the underside of the table, and including means for easily coupling and uncoupling the unit to and from the table, and for readily and effectively controlling the operation of the diaphragm mechanism whether it be coupled to the table or uncoupled therefrom.

Another object of the invention is to provide an improved diaphragm or collimator mechanism for use with an X-ray tube, which is extremely compact as compared to prior art devices, for optimum and effective use with an associated X-ray table.

A still further object of the invention is to provide a collimator mechanism of the latter type which includes first and second pairs of movable X-ray impervious members defining the peripheral limits of an X-ray beam, and wherein the X-ray impervious members of at least one of said pairs when in open position are substantially disposed in planes positioned generally parallel to the longitudinal axis of the X-ray beam as well as generally parallel to and in relatively close proximity to the defining walls of the collimator housing.

Briefly, in accordance with the invention, there is provided a compact diaphragm or collimator device which may be conveniently mounted on the protective housing of an X-ray tube, and which includes multiple diaphragms which are adjustable and controlled by means of gearing systems coupled to operating dials mounted on the exterior of an outer casing of the collimator device. In the preferred form of the invention, an automatically locking framework is mounted on the underside of the table proper of the X-ray apparatus, for receiving the collimator therein in mounted and interlocked relation, and means are provided on the framework for readily releasing the collimator and associated X-ray tube from the framework upon actuation of the said means. The aforementioned framework embodies operating means which automatically coacts with the operating dial or control means of the collimator mechanism when the latter is in mounted position in the said framework structure, so that the collimator mechanism may be readily controlled by means of operating levers disposed remote from the collimator, and with said operating levers being interconnected with the control means of the collimator mechanism by a cable control system. Thus, the collimator or diaphragm mechanism in combination with a single X-ray tube may be used and readily controlled, either under or over the table of the X-ray apparatus, thereby readily adapting the unit for both fluoroscopic and radiographic examinations, and providing an improved, compact arrangement for positive radiation protection and control of the X-ray beam.

Referring now to the drawings:

FIG. 1 shows the improved collimator mechanism mounted on the protective casing of an X-ray tube in operative relation above an X-ray tilt able in a manner for conventional radiographic examination, a radiographic film plate being shown in dot-dash lines below the upper surface of the table.

FIG. 2 is a fragmentary, perspective view of the collimator and X-ray tube assembly in position for movement into the automatically locking, mounting framework structure mounted on the underside of the tilt table of the X-ray apparatus, with the table preferably having been pivoted to a generally vertical position in the usual set-up for fluoroscopic examination.

FIG. 3 is an enlarged, perspective view of the collimator or shutter box device.

FIG. 4 is a generally enlarged, sectional view of the collimator shutter box taken substantially along the vertical plane of line 4—4 of FIG. 3, looking in the direction of the arrows, and illustrating in more or less detail the diaphragm mechanism and associated lever and gear train structure for operating the diaphragms of the collimator.

FIG. 5 is a vertical sectional view of the collimator box taken substantially along the line 5—5 of FIG. 4, looking in the direction of the arrows.

FIG. 6 is a vertical sectional view taken substantially along line 6—6 of FIG. 4, looking in the direction of the arrows.

FIG. 7 is a vertical sectional view taken substantially along line 7—7 of the FIG. 4, looking in the direction of the arrows.

FIG. 8 is an enlarged, perspective view of the aforementioned automatically locking framework for expeditiously mounting the collimator box and X-ray tube assembly on the underside of the table of the X-ray apparatus, and illustrating in detail the control structure on the framework for coaction with the controls of the collimator box proper, for positive operation of the collimator box when it is in mounted position on the underside of the table.

FIG. 9 is a reduced size, side elevational view of the framework structure illustrated in FIG. 8 illustrating the collimator box in assembled, interlocked position therewith and showing in dot-dash lines the release position of the locking mechanism of the framework.

FIG. 10 is an enlarged, fragmentary view illustrating one of the dial control wheels and associated target distance designations and radiation field size groupings, on the exterior of the collimator housing.

Referring now particularly to FIG. 1 of the drawings, an X-ray tube **10** is shown in supported, operative position above an X-ray tilt table **12**, and is intended to pass a beam of X-rays through a subject being examined on the table toward a radiographic film plate **14** disposed below the top of the table in a manner well known in the art.

X-ray tube **10** is preferably rotatably supported in a collar **15** connected to a telescoping and rotatable arm **16** (FIG. 2) which is carried by a carriage **18** vertically movable on supporting column **20** in a manner well-known in the art. Column **20** is also preferably movable lengthwise of the table and rotatable with respect to its vertical axis.

When employing X-ray apparatus in this manner, it is generally desirable to limit the field of radiation at the radiographic film to the precise area of the film. This is ordinarily accomplished by employing a diaphragm or collimator mechanism generally referred to by reference number **21** which utilizes adjustable X-ray impervious diaphragm members to confine the X-ray beam to the desired field of radiation.

The collimator or shutter mechanism of the instant invention comprises an outer casing or housing **22** suitably connected to the X-ray tube, and having an opening **23** or **24** in each end for passing a beam of X-rays from the source or X-ray tube towards the object being examined. As may be best seen in FIGS. 1 and 3, each of openings **23** and **24** is encircled by an outwardly converging cap or cone portion **22***a* or **22***b*, suitably secured to the upper or lower walls respectively of the housing proper, with the opening **24** being larger in area than opening **23**.

The collimator includes two adjustable diaphragms, each one of which is located adjacent a corresponding one of the openings **23** or **24** in housing **22** to thereby limit the field of radiation emanating from the X-ray tube **10**. Mounted interiorly of casing **22** and in depending relation from wall **25** thereof when the collimator mechanism is in surmounting position with respect to the table, as illustrated in FIG. 1, is a supporting frame **26** (FIGS. 4 and 5) for mounting the aforementioned diaphragms thereon.

Each diaphragm comprises two transversely disposed pairs of X-ray impervious plates with the plates of each pair being movable towards and away from one another to open and close the corresponding diaphragm opening in a manner to be hereinafter more fully described. One of the pairs of plates of each diaphragm are disposed outwardly of the other pair, or in other words toward the associated opening **23** or **24** in the casing **22**. Thus the outer plates **28**, **28***a* (FIGS. 5, 6 and 7) form one pair of plates for the larger diaphragm, or in other words the diaphragm for adjusting the size of opening **24** in the housing **22**, while inner plates **28***b* and **28***c* (FIG. 7) form the other pair of plates for opening **24**. Outer plates **30**, **30***a* (FIGS. 4, 5 and 6) form one pair of the plates for the other diaphragm, or in other words the diaphragm for adjusting the size of opening **23** in the collimator, while inner plates **30***c* and **30***d* (FIGS. 4 and 7) form the other pair of plates for opening **23**.

Plates **28**, **28***a* are each mounted on a generally U-shaped lever **32**, **34** with the arm portions of each of the levers curved inwardly as at **32***a*, **34***a* respectively, and at the terminal ends thereof are pivotally mounted as at **36** to opposite sides of frame **26** in housing **22**. Plates **28***b* and **28***c* are mounted on generally similar shaped levers **38** and **40**, but of somewhat smaller size than levers **32** and **34**, and with the terminal ends of levers **38** and **40** being pivotally mounted, as at **42**, to opposite ends of frame **26** in housing **22**.

Aforementioned outer plates **30** and **30***a* adjacent opening **23** are also mounted on generally U-shaped levers **44** and **46** respectively (FIGS. 4, 5 and 6) which are in turn pivotally mounted as at **48** to opposite sides of frame **26** in housing **22**, while inner plates **30***c* and **30***d* are likewise mounted on generally U-shaped levers **50** and **52** respectively (FIGS. 4 and 7), which are in turn pivotally mounted adjacent their terminal ends, as at **54**, to opposite ends of frame **26**. Aforementioned levers **44** and **46** are notched out, as at **56** (FIGS. 5 and 6) for receiving therein the outer end portions **57** of inner plates **30***c* and **30***d*, to thereby provide the greatest possible range of movement of the latter plates for the adjustment of opening **23** in the collimator, and with minimum space considerations. It will also be seen that inner plates **28***b* and **28***c* adjacent opening **24** are disposed generally parallel to the corresponding side walls of the collimator housing **22** when such plates are in fully open position (FIG. 7), thereby resulting in a minimum space consideration, and thus a highly compact collimator device.

In addition, it will be seen that plates **28***b* and **28***c* when in fully opened position lie substantially in planes which are positioned generally parallel to the longitudinal or lengthwise axis of the X-ray beam, which arrangement contributes greatly to the compactness of the collimator, while upon actuation of plates **28***b* and **28***c* along their paths of travel to closed position, such plates are moved into planes which extend generally diagonally transverse to the lengthwise axis of the X-ray beam. Such a novel and compact collimator contributes greatly to its use both above and beneath the X-ray table **12** and in a manner heretofore unknown in the art.

The actuating mechanism for the diaphragm supporting levers will now be described. At one end of each of levers **32**, **34**, **44** and **46** and in concentric relation to the axis of rotation thereof, there is secured a gear element **58**, **58***a*, **58***b* or **58***c* (FIGS. 4 and 5), all of the latter being in meshing relation. The other end of each of the levers **32**, **34** and **46** is merely pivotally supported as at **36** or **48** (FIG. 6), as aforementioned, directly to the adjacent side of frame **26**, while lever **44** at its other end has a gear element **60** (FIGS. 4 and 6) secured thereto in concentric relation to the axis of rotation of lever **44**, in addition to its being pivotally mounted to the frame **26**. A pinion gear **61** mounted on a shaft **62** journaled in frame **26** meshes with gear **60** for driving the latter. Mounted on the outer end of shaft **62** and secured thereto is a dial wheel **63**. Wheel **63** is positioned in an opening **64** in housing **22**, in generally flush relation to the exterior of the housing. Target distances and associated field of radiation sizes are marked in numerical designations and groupings along the periphery of opening **64**, as at **64***a* (FIG. 10) with the wheel **63** having a marking thereon adapted for alignment with a selected target distance mark for the corresponding dimension of the field of radiation which it controls. The alignment marking on the dial wheel and the target distance markings and associated field size groupings around the wheel are so located with respect to each other as to provide a direct reading of the field size at a selected target distance. This arrangement eliminates the necessity for interpreting charts and tables or the like, and then translating such information into an adjustment of the diaphragm openings. With such an arrangement an operator can directly set the dimensional size of the field of radiation desired on the corresponding dial wheel for the selected target distance.

Aforementioned gear element **58***a* attached to lever **34** also has a shaft **65** (FIGS. 3 and 4) secured thereto and

rotatably journalled in frame 26. Shaft 65 extends exteriorly through an opening in housing 22 and has a handle 65*a* secured thereto with an upstanding pin or abutment element 65*b* attached to the outer end of the handle 65*a* for a purpose to be hereinafter described in connection with control of the collimator mechanism when the latter is in secured relation on the underside of tilt table 12.

Thus it will be seen that rotation of dial wheel 63 will rotate pinion 61 and gear 60, thereby causing pivoting of lever 44, which in turn causes rotation of intermeshing gears 58, 58*a*, 58*b* and 58*c*, resulting in simultaneous pivoting of levers 46, 32 and 34 with lever 44, and corresponding movement of the associated X-ray impervious plates 28, 28*a* and 30, 30*a* either toward or away from one another to partially adjust the size of openings 23, 24 in the collimator. It will also be seen that the same result may be accomplished by rotating handle 65*a* which rotates intermeshed gears 58*a*, 58, 58*b* and 58*c*, thereby resulting in pivotal movement of the associated lever members.

In order to actuate the other levers 38, 40, 50 and 52 (FIG. 7) of the diaphragm mechanisms, a gear element 66, 66*a*, 66*b* or 66*c* is attached to a respective one of such levers in concentric relation to its axis of rotation, with such gear elements being in intermeshing relation. The other ends of the lever elements are merely pivotally mounted as at 42 or 54, as aforementioned, to the frame 26. Aforementioned gear 66 is secured to a shaft 66*a* (FIG. 4) journalled in frame 26 and extending through an opening 68 in housing 22 of the collimator. A dial wheel 70 positioned in opening 68 in generally flush relation to the exterior of the housing is secured to the outer end of shaft 66*a* and is adapted for actuation of the lever elements 38, 40, 50 and 52 of the diaphragm mechanisms. In other words, upon rotation of wheel 70, intermeshed gears 66, 66*a*, 66*b* and 66*c* are simultaneously rotated thereby pivoting associated levers 38, 40, 50 and 52 and moving plates 28*b*, 28*c* and 30*c*, 30*d* toward or away from one another to adjust the size of respective openings 24 and 23 in the collimator housing. Dial wheel 70 and the periphery of the associated opening 68 are marked in a similar manner as aforedescribed for dial wheel 63, whereby the operator can directly set the dimensional size of the field of radiation desired on the corresponding dial wheel 70 for the selected target distance. An outwardly extending abutment or pin 72 is mounted on dial wheel 70 for use in controlling or in actuating the diaphragm mechanism when the collimator is in mounted relation on the underside of tilt table 12 as will be hereinafter discussed in greater detail.

It will be seen, therefore, that each of the diaphragm assemblies consists of two sets of transversely disposed shutters driven by a simple arrangement of intermeshing gears. X-ray impervious plates are mounted on associated levers and the levers are fastened to pivot with rotation of the intermeshed gears. When the gear drive shafts are turned, the shutters open and close forming two openings which collimate the X-ray beam into a desired field size. The shutter levers and associated X-ray impervious plates are pivoted on the gear centers that will give the path of the shutters the maximum radius, thus allowing the two sets of diaphragms assemblies, one set operating within the other, to be made into a compact, space saving assembly, enabling the operator to obtain any desired rectangular or square pattern with an X-ray beam. An important feature of this construction is its compactness resulting in an optimum assembly for mounting on the underside of the tilt table.

When it becomes desirable to utilize the X-ray tube and collimator unit on the underside of the table, as for instance during a fluoroscopic examination, the table 12 may be tilted to a generally vertical position and the collimator and X-ray unit may be swivelled so as to present the latter in generally confronting relation to the underside of the tilt table as may be seen in FIG. 2. For this type of set-up, an attaching framework structure 75 (FIGS. 2, 8 and 9) is attached to the underside of the table 12 for receiving the collimator mechanism in interlocked relation, to hold the latter in proper position. The framework 75 includes operating means which mechanically coacts with the operating mechanism (i.e. dial wheel 70 and operating lever 65*a*) of the collimator, to provide an arrangement for readily controlling the actuation of the diaphragms from an area remote from the collimator proper, thereby providing for expeditious control of the X-ray apparatus when the collimator is mounted on the underside of the table.

Framework 75 is preferably attached to bars 78 on the underside of tilt table 12 by means of bolt and nut assemblies 80 (FIG. 9), the latter extending through elongated openings 82 in framework 75 for providing means for slightly adjusting the position of the framework with respect to the table. Framework 75 includes generally V-shaped slots 84 in the sides thereof for receiving therein guide lugs 86 mounted on the sides of the collimator housing 22 for guiding and holding the collimator and associated X-ray tube in position in framework 75. Lugs 86 are preferably mounted on slide pieces 87 for protecting the finish of the collimator housing. The inner sides of framework 75 adjacent slots 84, as well as the inner top and bottom surfaces of the framework, are tapered outwardly as at 89 for guiding and facilitating the movement of the lugs 86 into slots 84. A locking bar 90 is slidably mounted on each side of framework 75 by means of pins 90*a* on framework 75 and elongated slots 90*b* in the locking bars, and comprises locking dogs 92 secured thereto, which are adapted to coact with the associated of lugs 86, for holding the collimator 21 in locked position in framework 75. Spring elements 94 mounted by means of nut and bolt assemblies 96 to framework 75 and locking bars 90, resiliently urge the bars 90 and associated dogs 92 into locking position. A handle element 98 extending between the upper portions of bars 90 provides for manually releasing the locking dogs 92 from locking coaction with the lugs 86 on the collimator housing, thereby permitting withdrawal of the collimator and X-ray unit from framework 75. The dogs 92 comprise cam surfaces 99 which coact with lugs 86 on the collimator housing 22 to automatically move the locking bars upwardly to permit entry of the lugs 86 into the inner portion of slots 84, after which springs 94 automatically move the bars downwardly into interlocking relation with lugs 86.

Operating fork elements 100 and 102 are respectively pivotally mounted, as at 103, on the inner surfaces of the top and side portions, as viewed in FIG. 8, of framework 75. Forks 100 and 102 are connected to operating cables 100*a* and 102*a* respectively, which extend to operating levers 104 and 104*a* mounted on the tilt table 12 remote from the collimator mechanism. Forks 100 and 102 comprise inwardly converging generally Y-shaped slots 106 which are adapted to receive a respective one of pins 72 or 65*b* of the collimator operating mechanism proper during the movement of the collimator 21 into framework 75. The pins are adapted to be positioned in the inner narrow portion 106*a* of the slots 106 with the wide mouths of the slots adapted to guide the pins into final position in such inner portions of the slots. Thus, it will be seen with the latter arrangement, actuation of the readily accessible operating levers 104 and 104*a*, pivots the forked elements 100 and 102 mounted on the framework 75 on the underside of the table, which in turn actuates the dial wheel 70 and/or the arm 65*a* and the associated shaft 65, thereby actuating the diaphragm assemblies of the collimator proper. Thus, it will be seen that the roentgenologist may readily control the collimator mechanism when it is in attached position on the underside of the table and from a position remote from such collimator mechanism. By merely lifting up

on handle 98 of the locking bars 90, the latter may be easily disengaged from interlocking coaction with the lugs 86 on the collimator housing, and the collimator and associated X-ray tube unit may be readily pulled out or removed from framework 75 on the tilt table 12 for use above the table. In dot-dash lines in FIG. 9 of the drawings, there is shown the position of the locking bars when the latter are so moved upwardly out of interlocking coaction with lugs 86.

From the aforegoing discussion and accompanying drawings, it will be seen that the invention provides not only an improved gear actuated collimator mechanism for expeditiously controlling the field of radiation at various target distances of the associated X-ray tube, but also a compact collimator unit which can be readily set up and controlled either over or under the tilt table of the X-ray apparatus, thereby providing with only one unit a mechanism giving optimum results and protection in both fluoroscopic and radiographic operations.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention of excluding any equivalents of any of the features of the invention described or shown or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

I claim:

1. In an X-ray apparatus, the combination of an X-ray table, a compact adjustable diaphragm mechanism adapted to be mounted adjacent a source of X-rays for controlling the field of radiation of the X-ray beam, control means on the exterior of said mechanism for selectively adjusting the size of the field of radiation, means movably mounting said mechanism with respect to said table so that said mechanism is selectively positionable either over or under said table, means on said table for detachably coupling said mechanism to the underside of said table, and means adapted for automatic coaction with said control means upon coupling of said mechanism to said table for adjusting said mechanism from an area generally remote therefrom.

2. In an X-ray device the combination of a table, a compact X-ray diaphragm mechanism, means movably mounting said mechanism with respect to said table for selective positional movement of said mechanism over and under said table, said mechanism being adapted to be mounted adjacent a source of X-rays and having openings at opposite ends thereof for passing an X-ray beam therethrough, control means on the exterior of said mechanism for manually adjusting the permissible field of radiation, a framework mounted on the underside of said table, said framework being adapted to receive said mechanism therein in removable interlocked relation upon movement of said mechanism to the underside of said table, and means on said framework adapted for automatic coaction with said control means upon entry of said mechanism into said framework for controlling the actuation of said mechanism from an area generally remote from said framework.

3. In an X-ray device in accordance with claim 2, wherein said framework includes means for automatically locking said diaphragm mechanism in place on the underside of said table upon entry of said mechanism into said framework.

4. A compact X-ray diaphragm assembly for use both above and under an X-ray table comprising a casing adapted to be mounted adjacent a source of X-rays and having openings at opposite ends for passing an X-ray beam therethrough, an adjustable diaphragm disposed interiorly of said casing adjacent each opening for limiting the field of radiation, each diaphragm including two transversely disposed pairs of relatively movable, generally parallel extending X-ray impervious members, levers pivotally mounted interiorly of said casing and supporting corresponding X-ray impervious members of each diaphragm and being so disposed as to provide a smaller diaphragm opening at the end of the casing adjacent to the X-ray source, gear means disposed interiorly of said casing and interconnecting the levers for moving the X-ray impervious members of each diaphragm toward and away from each other generally transverse to the X-ray beam, means operatively connected to said gear means and extending exteriorly of the casing for actuation of said gear means, said means comprising dial wheels disposed substantially flush with the corresponding exterior surfaces of said casing, at least one of said wheels including projecting abutment means extending a predetermined amount outwardly from the corresponding exterior surface of said casing and being adapted for actuating the associated wheel when said diaphragm assembly is used on the underside of an X-ray table, and visible means exteriorly of said housing coacting with said means throughout the range of operation thereof to provide direct indication of resultant radiation field size for any selected target distance.

5. The X-ray diaphragm assembly of claim 4, wherein said casing includes outwardly extending lugs on the sides thereof, said lugs being adapted to be received in a framework attached to the underside of an associated tilt table of an X-ray apparatus for mounting said diaphragm assembly on said tilt table.

6. An X-ray diaphragm assembly in accordance with claim 4, wherein said casing is of box-like configuration and wherein one pair of X-ray impervious members of each of said diaphragms is disposed inwardly of the other of said pairs of members, said inwardly disposed pair of members adjacent one of said openings being generally disposed in planes extending substantially parallel to the planes of the associated side surfaces of said casing when said last mentioned pair of members is disposed is maximum open position.

7. In an X-ray device, the combination of a tilt table, a compact X-ray diaphragm mechanism including an outer casing element, means movably mounting said mechanism with respect to said table for selective positional movement of said mechanism either over or under said table, said mechanism being adapted to be mounted adjacent a source of X-rays and having openings adjacent opposite ends thereof for passing an X-ray beam therethrough, adjustable diaphragm means operatively disposed intermediate said openings interiorly of said casing element for limiting the field of radiation, gear means disposed interiorly of said casing element and coacting with said diaphragm for actuating the same, operating means externally accessible of said casing for actuation of said gear means to thereby adjust the permissible field of radiation, a framework mounted on the underside of said table and adapted to receive said diaphragm mechanism therein for detachably mounting the latter on the underside of said table, said framework including locking means for automatically locking said diaphragm mechanism in predetermined position upon entry of the latter into said framework, and means on said framework adapted for automatic mechanical coaction with said operating means when said diaphragm mechanism is positioned in said framework for controlling the operation of said gear means at an area generally remote from said diaphragm mechanism.

8. In an X-ray device in accordance with claim 7 wherein said operating means comprises a plurality of rotatable dial wheels disposed substantially flush with the respective exterior surfaces of said casing, and abutment means projecting outwardly a predetermined amount with respect to said casing on at least one of said dial wheels, said abutment means being disposed eccentrically with respect to the axis of rotation of the associated wheel, said means on said framework comprising a fork element pivotally mounted thereon, and wherein said abutment means is adapted to be received in coacting relation with said fork element upon entry of said diaphragm mechanism into said framework, and a cable secured to said fork element for

actuation thereof, said cable extending to a point remote from said framework whereby pivoting of said fork element occurs upon movement of said cable to thereby rotate the associated of said dial wheels.

9. A device adapted for mounting on the underside of the table of an X-ray apparatus and for receiving in detachable relation therein an adjustable X-ray diaphragm mechanism including an outer generally polygonal shape casing, said device comprising a polygonal sided framework having a plurality of slots therein for receiving outwardly extending lugs on the casing of said diaphragm mechanism, said framework including locking means for automatic coaction with the lugs to lock said X-ray diaphragm mechanism in predetermined position upon entry of the casing of said mechanism into said framework, and means for manually deactivating said locking means.

10. A device in accordance with claim 9, including means adapted for mechanical coaction with exteriorly accessible operating means on said adjustable diaphragm mechanism upon entry of the casing of said mechanism into said framework, for operation of said diaphragm mechanism at a point generally remote from said framework.

11. In a compact X-ray beam collimator for definition of an X-ray beam of a desired cross sectional area and configuration, said collimator being adapted for use both above and under an X-ray table and comprising a box-like casing adapted for mounting adjacent a source of X-rays and having openings at opposite ends for passing an X-ray beam therethrough, an adjustable diaphragm disposed interiorly of said casing adjacent each opening for limiting the field of radiation, each diaphragm including two transversely disposed pairs of relatively movable generally parallel extending X-ray impervious members, each of said members being supported on a lever pivotally mounted within said casing, said members and supporting levers being so disposed as to provide a smaller diaphragm opening at the end of the casing adjacent to the X-ray source, one pair of said members of each of said diaphragms being disposed inwardly of the other of said pairs, the members of at least one of said inwardly disposed pairs when in fully opened position being disposed in planes extending substantially parallel to the lengthwise axis of the X-ray beam and in closely positioned relation to confronting sides of said casing, first gear means rotatably mounted interiorly of said casing and operatively interconnecting the levers mounting the outer of said pairs of members of said diaphragms, second gear means rotatably mounted interiorly of said casing and operatively interconnecting the levers mounting the inner of said pairs of members of said diaphragms, means operatively connected to each of said gear means and extending exteriorly of the casing for actuation of said gear means, said means comprising dial wheels disposed substantially flush with corresponding exterior surfaces of said casing, at least one of said wheels including projecting abutment means extending a predetermined amount outwardly from the associated exterior surface of said casing and adapted for actuation of the associated wheel when said collimator is used on the underside of an X-ray table.

12. A compact diaphragm assembly for use both above and under an X-ray table, comprising a casing adapted to be mounted adjacent a source of X-rays and having openings at opposite ends for passing an X-ray beam therethrough, adjustable diaphragm means, pivotable lever means operatively mounting said diaphragm means intermediate said openings for limiting the field of radiation, said diaphragm and lever means being disposed interiorly of said casing, gear means mounted on said casing interiorly thereof and operatively connected to said lever means for adjusting said diaphragm means to vary the field of radiation, and rotatable control means exteriorly accessible of said casing and operably connected to said gear means for actuation of the latter, said rotatable control means being disposed substantially flush with the respective exterior surface of said casing and including abutment means projecting generally perpendicularly outwardly with respect to said casing, for actuating said control means when said assembly is used on the underside of an X-ray table, said abutment means being off-set from the axis of rotation of the respective control means.

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